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ORIGINAL ARTICLE

A new species and a new record of the genus *Balanococcus* Williams (Hemiptera: Coccoidea: Pseudococcidae) from China

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Abstract A new species and a new record of the genus *Balanococcus* Williams are described from China. They are *B. zhejiangensis* sp. nov. and *B. kwoni* Pellizzari & Danzig, 2007. The new species, collected from Zhejiang, China under leaf sheath of *Phyllostachys praecox*, is similar to *B. kwoni* Pellizzari & Danzig, but can be distinguished by its hind coxa inflated, and only small type of oral collar tubular ducts present on dorsal surface. A key to Chinese species of *Balanococcus* is given. All specimens examined are deposited in the Insect Collection of Beijing Forestry University.

Key words Hemiptera, Pseudococcidae, *Balanococcus*, new species, new record, China.

1 Introduction

The genus *Balanococcus* was established by Williams (1962) with *Ripersia scirpi* Green, 1921 as type species. The diagonistic characters are: body of adult female on microscope slide elongate oval; antennae with 6 or 7 segments; legs small, claw without denticle; hind coxa expanded with groups of translucent pores; 1–5 pairs of cerarii, cerarius on anal lobe each with 2 conical setae; quinquelocular pores absent; trilocular pores on both surfaces; multilocular pores distributed on the entire margin; oral collar tubular ducts short, with deep collar; living normally under the leaf sheath of Poaceae and Cyperaceae.

There are 35 species in the genus *Balanococcus* on world, distributed mainly on Australian and Palaearctic Regions (Ben-Dov *et al*., 2013). Three species have been reported from China, which are: *B. agrostis* Wu, 1999 from Henan Province on *Agrostis* sp., *B. caucasicus* Danzig, 1985 from Henan Province on Poaceae, and *B. takahashi* Mckenzie, 1964 from Beijing on *Zoysia tenuifolia* (Wu, 1999a, b; Xia & Wu, 2012). The species *B. diminutus* (Leonardi, 1918), recorded in ScaleNet by Ben-Dov *et al*. (2013), and Tang (1992) and Tao (1978) treated it as *Trionymus diminutus* for collection from Taiwan, was not listed in *Mealybugs of Taiwan* (Tsai, 2011) and *Scale Insects Name of Taiwan* (Tao, 1989). So, it is controversial that whether this species has been reported from Taiwan. In this paper, one new species and one new record to China are described and illustrated, bringing the total number of species in the genus to 5 species in China.

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2 Materials and methods

The mealybug specimens were collected individually and stored in 75% alcohol. Slide-mounted specimens were prepared using the method of Borchsenius (1950), stained in acid fuchsin and mounted in Canada balsam. The morphological terms used in the descriptions are explained by Williams (2004). Measurements were made by using a light microscope (Leica DME) fitted with an ocular micrometer. Measurements are in micrometers (μm) except that length and width of body are in millimeters (mm); all measurements are given as minimum and maximum, and followed by measurements of the holotype for new species in parentheses. Setal lengths included the setal base. The drawings are as usual for illustrating Coccoidea, with the central drawing showing the outline of body and distribution of characters, and the enlarged drawings (not to scale) showing the structure of important characters. Scale insect illustrations show the dorsal surface on the left half and the ventral surface on the right half.

All specimens (mounted and materials in 75% alcohol) are deposited in the Insect Collection, the Department of Forestry Protection, Beijing Forestry University, Beijing, China (BFUC).

3 Results

Key to *Balanococcus* species of China

1. Multilocular pores distributed only on venter……..……...…2
   Multilocular pores distributed on both surface of body……...……..3
2. Circulus absents…….……***B. caucasicus* Danzig**
   Circulus presents……...…..……..***B. agrostis* Wu**
3. Oral collar tubular ducts on venter with about 1/2 deep collar and in one size ……...….***B. takahashi* McKenzie**
   Oral collar tubular ducts on venter with less than 1/3 deep collar and in 2 sizes…….……..……4
4. Hind coxae each extremely wider than fore or middle coxae; only the same size of oral collar tubular ducts present on the dorsal surface……..……***B. zhejiangensis* sp. nov.**
   Hind coxae each slightly wider than fore or middle coxae; two sizes of oral collar tubular ducts present on the dorsal surface……...…..***B. kwoni* Pellizzari & Danzig**

3.1 *Balanococcus zhejiangensis* sp. nov. (Fig. 1)

Body of adult female on slide elongate oval, sides almost parallel, about 2.05–3.12 (2.10) mm long and 0.66–1.25 (0.66) mm wide. Anal lobes prominent, each with ventral surface bearing an apical seta 110–130 (120) μm long, 1.9 times as long as seta on anal ring. Antennae each about 280–300 (280) μm long, with 7 segments, apical segment longest, with 2 fleshy setae. The ratio of length for each segment: I-12; II-16; III-12; IV-17; V-12; VI-13; VII-34. Eye spot present. Labium with 1 segment, 80–100 (90) μm long, 7/10 of length of the clypeolabral shield, each side with 5 stout setae. Legs developed, 2 setae present under end of tibia, claw slender, without denticle, both tarsal digitules and claw digitules knobbed, longer than claw. Hind coxa 60–100 (90) μm long, larger than fore or middle coxa, with translucent pores on anterior and posterior surfaces and derm anteriorly next to hind coax, forming pore plate; hind trochanter and femur 160–190 (190) μm long, nearly equal to length of tibia and tarsus (190–200 (200) μm); ratio of lengths of hind tibia to tarsus 1.6. Circulus small and almost circular, 30–40 (30) μm in diameter, lying between abdominal segments III and IV. Ostioles with anterior and posterior pairs, each lip with 3–4 trilocular pores. Anal ring present at the end of body, 70 μm wide, with 2 rows of cells and 6 setae, each seta 60–70 (60) μm long. A pair of cerarii on anal lobes only, each containing 2 conical setae and 2–3 trilocular pores, situated on a membranous area.

Dorsum. Dorsal surface with flagellate setae, but fewer than those on ventrum, each side of abdominal segments V–VII with 1 stout flagellate seta on margin. Multilocular disc pores in groups present on submarginal areas of abdominal segments V–VIII. Trilocular pores present, evenly and widely spaced. Oral collar tubular ducts of one size, 6.0 μm long and 2.5 μm wide, present on submarginal areas of abdominal segments V–VII.

Ventrum. Flagellate setae on ventrum longer than those on dorsum, each side of abdominal segments V–VII with 1 long flagellate setae on margin. Multilocular disc pores, froming marginal band from prothorax to the end of the abdomen, transverse row or band across posterior edges of abdominal segments V–VIII, and sometime a few present interior to hind

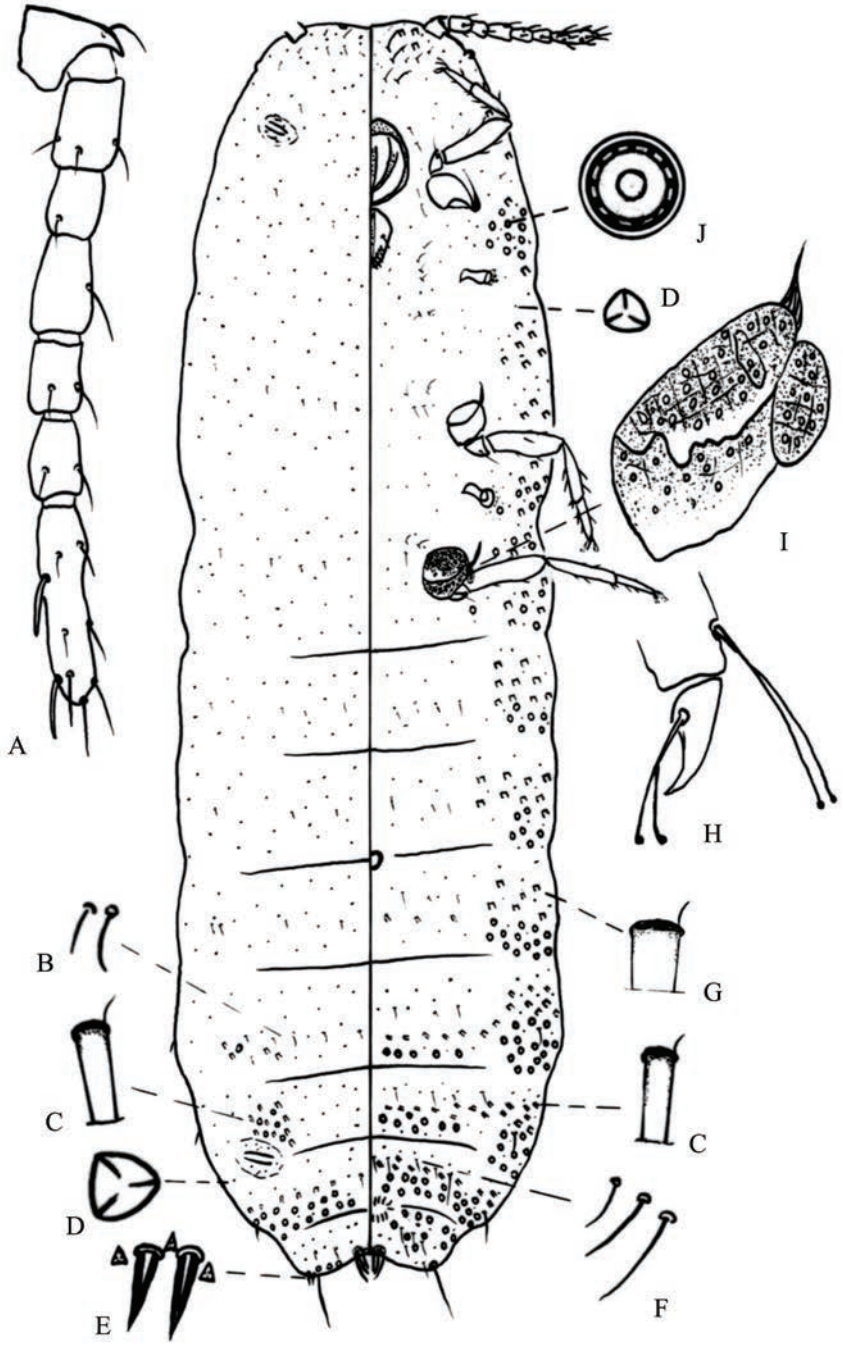

Fig. 1. Adult female of *Balanococcus zhejiangensis* **sp. nov.** A. Antenna. B. Dorsal flagellate setae. C. Small size of oral collar tubular duct. D. Trilocular pore. E. Cerarius on anal lobe. F. Ventral flagellate setae. G. Large size of oral collar tubular duct. H. Claw of hind leg. I. Hind coxa. J. Multilocular disc pores.

coxa. Trilocular pores same as those on dorsum. Oral collar tubular ducts of 2 sizes, the large one, 6.0 μm long and 4.0 μm wide, forming longitudinal band along margin; the small one, same as those on dorsum, forming narrow transverse band on abdominal segments IV–VII.

Holotype ♀, China, Zhejiang Province, Lin'an City (30°14′N, 119°42′E), under the leaf sheath of *Phyllostachys praecox*, 9 April 1999, San-An Wu leg. Paratypes 4 ♀♀, same data as holotype.

Host plant. *Phyllostachys praecox*.

Remarks. The new species is similar to *B. kwoni* Pellizzari & Danzig, 2007, but hind coxae each are extremely wider than fore or middle coxae; only the same size of ducts present on the dorsal surface.

Etymology. This new species is named after the province name of its collecting locality.

3.2 *Balanococcus kwoni* Pellizzari & Danzig **New record to China** (Fig. 2)

Balanococcus bambusum (nec Tang, 1992); Kwon, Danzig & Park, 2003: 398 (misidentification).
Balanococcus kwoni Pellizari & Danzig, 2007: 65; Malumphy & Badmin, 2012: 18, 38.

Body of adult female on slide elongate oval, sides sub-parallel, about 3.8–4.3 mm long and 1.4–1.8 mm wide. Anal lobes barely perceptible, each with ventral surface bearing an apical seta 125–150 μm long. Antennae each about 280–310 μm long, with 7 segments, apical segment longest, lateral margin with 3 fleshy setae. Legs small and slender, 2 setae present under end of tibia. Hind coxa 60–130 μm long, hind trochanter and femur 190–240 μm long, hind tibia and tarsus 210–240 μm long. Claw without denticle, 15–20 μm long, tarsal digitules 30–40 μm long, claw digitules 80–100 μm long, both tarsal digitules and claw digitules knobbed, all longer than claw. Ratio of lengths of hind tibia and tarsus to hind trochanter and femur 1.0. Ratio of lengths of hind tibia to tarsus 2.0. Hind coxa slightly inflated, translucent pores present on lateral surfaces. Eye spot present. Labium with 2 segments, 95–120 μm long, 1/2 of the length of clypeolabral shield. Circulus small and rectangle, 60–80 μm wide, lying between abdominal segments III and IV. Spiracles cylinder-shaped, with associated trilocular pores. Ostioles poorly developed, with anterior and posterior pairs, each lip with 3–5 trilocular pores. Anal ring present at the end of dorsum, 70–80 μm wide, with 2 rows of cells and 6 seta, each setae 90–160 μm long, ratio of length of seta on anal ring to the diameter of anal ring 1.3–2.1. Cerarius on anal lobes only, each containing 2 conical setae and 6–8 trilocular pores, In addition, 0–2 conical setae present on marginal area of abdominal segment VII, but without trilocular pores around those conical setae, all situated on a membranous area.

Dorsum. Flagellate setae stout, more on head. Multilocular disc pores present in one or two rows on posterior abdominal segment V–VII, and form narrow longitudinal band around margin. Trilocular pores evenly distributed. Oral collar tubular ducts of 2 sizes, both with deep collars, the large one 6.0 μm long, 3.5 μm wide, the small one 4.5 μm long and 2.0 μm wide, more numerous on margin of last abdominal segments, but sometimes absent from abdominal segment Ⅷ, rare on margin of thorax.

Ventrum. Ventral flagellate setae present, sparse, slender, longer on posterior abdominal segments, more on head and around vulva. Multilocular disc pores present in transverse row on abdominal segments V–VI, in transverse band on segments VII–IX, and form longitudinal band around margin. Trilocular pores evenly distributed. Oral collar tubular ducts, similar in size to those on dorsum, more numerous on last abdominal segments, distributed among multilocular disc pores, present also on margin of head and thorax and few present in medial part of abdominal segments.

Host plants. *Bambusa* sp., *B. vivax*, *Fargesia* sp., *Indocalamus longiauritus*, *In.tessellatus*, *Pharus* sp., *Phyllostachys* sp., *Ph.bambusoides*, *Ph.praecox*, *Ph.nigra*, *Pleioblastus* sp., *Pl.linearis*, *Pl.variegatus*, *Pseudosasa japonica*, *Sinarundinaria nitida*, *Thamnocalamus crassinodus* (Poaceae).

Distribution. China (Hubei, Zhejiang); South Korea, Italy, United Kingdom.

Material examined. 7♀♀, Hubei Province, Xianfeng County, Pingbaying Forest Field, under leaf sheath of *Indocalamus longiauritus*, 21–22 July 1999, San-An Wu leg.; 5♀♀, Hubei Province, Wufeng County, Houhe Nature Reserve, under leaf sheath of bamboo, 11–12 July 1999, San-An Wu leg.; 1♀, Hubei Province, Hefeng County, Shayuan, under leaf sheath of bamboo, 18 July 1999, San-An Wu leg.; 1♀, China, Zhejiang Province, Hangzhou City, on *Phyllostachys praecox*, 17 August 2003, San-An Wu leg.; 1♀, Zhejiang Province, Lin'an City, under leaf sheath of *Indocalamus tessellatus*, 6 August 2008, Jin Liu leg.

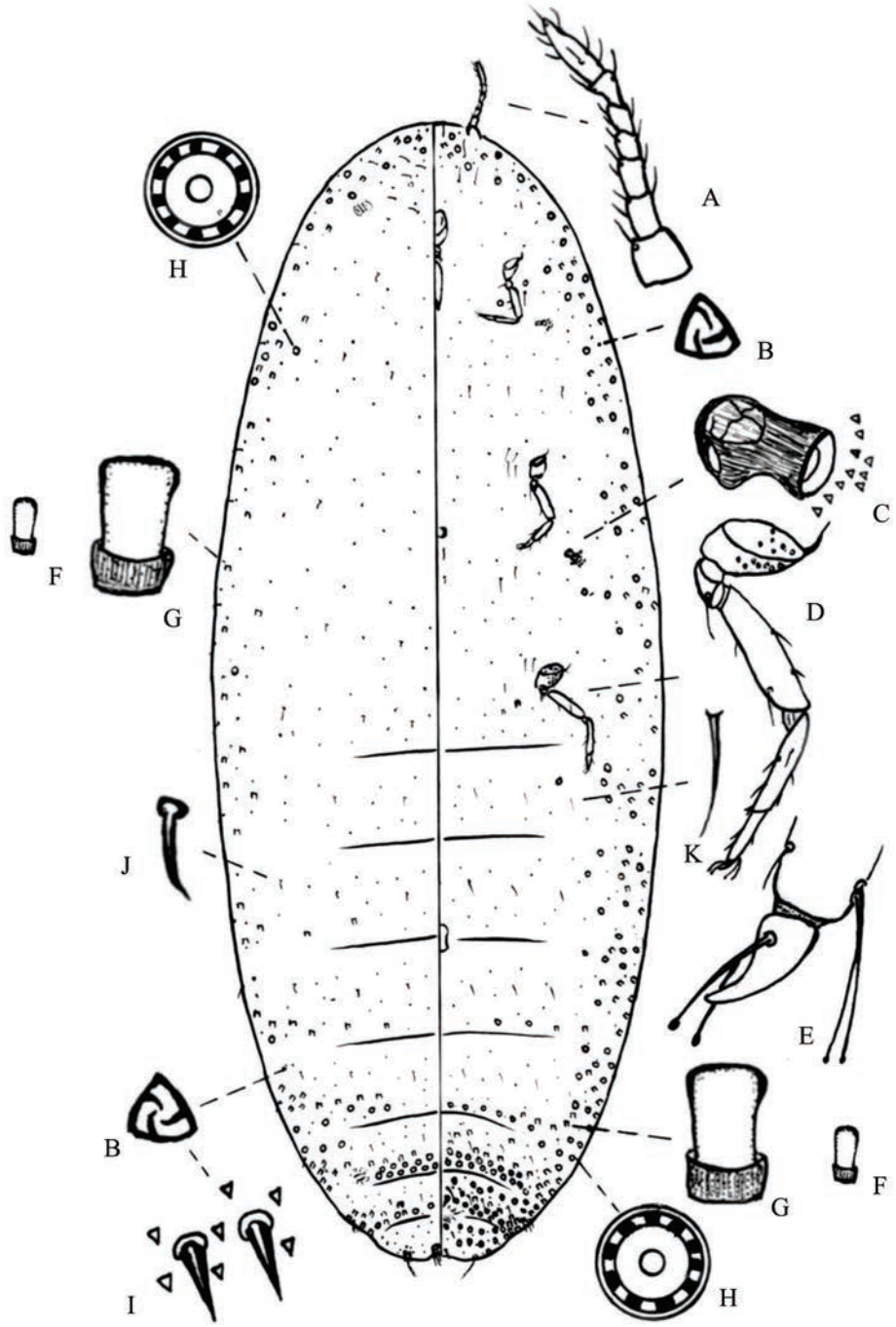

Fig. 2. Adult female of *Balanococcus kwoni* Pellizzari & Danzig, 2007. A. Antenna. B. Trilocular pore. C. Spiracle. D. Hind leg. E. Tarsus and claw of hind leg. F. Small size of oral collar tubular duct. G. Large szie of oral collar tubular duct. H. Multilocular disc pores. I. Cerarius on anal lobe. J. Dorsal flagellate seta. K. Ventral flagellate seta.

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